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Current status of VMF3o

Janina Boisits, Daniel Landskron, and Johannes Böhm
Department of Geodesy and Geoinformation, TU Wien, Vienna, Austria (janina.boisits@tuwien.ac.at)

TU Wien is developing a new model for correcting path delays of optical signals (e.g. SLR observations) caused by the neutral atmosphere. The model is called Vienna Mapping Functions 3 – optical (VMF3o) and is focusing on new coefficients for hydrostatic and wet Mapping Functions (MF) based on ray-traced delays, but also provides Zenith Hydrostatic Delays (ZHD) and Zenith Wet Delays (ZWD), as well as in the near future horizontal gradients derived from ray-tracing.
The first version of VMF3o provided MF coefficients and zenith delays on a global 1°x1° grid with a temporal resolution of 6h. A validation of the model was carried out using observations to LAGEOS-1 and LAGEOS-2 satellites. The tests yielded promising results, especially when comparing the mean absolute values of observation residuals applying VMF3o and the currently recommended model, respectively.
However, the grid interpolation and height extrapolation in order to calculate the parameters valid at the respective site were found to be inappropriate for targeting highest precision. Thus, the MF coefficients and zenith delays of the current version of VMF3o are derived from ray-traced delays computed directly at the SLR sites. Furthermore, the model will include hydrostatic and wet horizontal gradients to account for atmospheric asymmetries.
Based on the results of the first tests, the final version of VMF3o is expected to significantly advance the current accuracy level of SLR observations. By doing so, it will help to mitigate systematic error sources and to further improve SLR products.